VACUUM CLEANER COMPRISING AN ELASTIC BUMPER STRIP

The invention relates to a vacuum cleaner according to the preamble of claim 1.

A vacuum cleaner for floors comprising a vacuum cleaner housing having a external circumferential elastic impact bumper strip is known from DE 87 11 960. The impact bumper strip comprises a strip which is affixed to the vacuum cleaner housing. The strip has one longitudinal side projecting obliquely outwards with respect to the vacuum cleaner housing. An increasing distance exists between the strip and the vacuum cleaner housing from the fixing point of the strip as far as its free longitudinal side. The impact bumper strip can consist of a very solid material since the elasticity required to cushion impacts is achieved by the geometric arrangement of the strip on the vacuum cleaner housing. The elasticity and the spring path of the strip can be influenced by selecting the material for the strip, by suitably dimensioning its wall thickness, as well as the position of the connection and the angle at which the strip projects from the lower half of the housing. A disadvantage with this impact bumper strip however is the circumstance that a different type of geometrical shape or arrangement of the impact bumper strip is required depending on the desired elasticity. However, with regard to the overall appearance of the vacuum cleaner it is disadvantageous if the overall appearance of the vacuum cleaner is changed by defining the required elasticity of the impact bumper strip.

Another disadvantage with impact bumper strips according to the prior art is that a sharp edge is predefined by the projecting free longitudinal side of the impact bumper strip which causes scratches, for example, when it impacts against furniture.

The object of the invention is to provide a vacuum cleaner comprising a housing and an impact bumper strip where the aforesaid disadvantages are eliminated. In particular, an impact bumper strip is to be provided whose elasticity can be defined without substantially influencing the external appearance of the vacuum cleaner.

The object according to the invention is solved for a generic vacuum cleaner in that the housing has a retaining element which holds the second longitudinal side of the impact bumper strip under elastic pre-tension against the housing. The retaining element makes it possible to hold the longitudinal side which stands proud from the outer surface of the housing under no tension, against the housing under elastic pre-tension. The impact bumper strip obtains softer or harder spring properties according to the magnitude of the elastic pre-stress. These spring properties are determined by the choice of material for the impact bumper strip and by the geometry, especially by the cross-section, i.e., the width and height of the impact bumper strip as well as by the distance between the fixing point of the impact bumper strip and the fixing point of the retaining element. The external appearance of the vacuum cleaner remains substantially unchanged despite the variation in these parameters.

Since the outer circumference of the vacuum cleaner is no longer formed by a projecting sharp edge but by a flat side section of the impact bumper strip, the additional advantage is obtained that scratching of pieces of furniture is largely avoided. The vacuum cleaner can thus be operated so that it protects the furniture.

If the housing of the vacuum cleaner is constructed in two parts, the elastic impact bumper strip can be held on the

first housing part and the second housing part can have the retaining element. Since the impact bumper strip and the retaining element are constructed on different housing parts, the impact bumper strip can be held by the retaining element as soon as the two housing parts of the vacuum cleaners are assembled. Assembly of the vacuum cleaner is thereby simplified since both the assembly of the vacuum cleaner housing and also the assembly of the impact bumper strip can be accomplished on the retaining element in one assembly step.

In an advantageous embodiment the elastic impact bumper strip is constructed on a lower part of the vacuum cleaner and the retaining element is constructed on an upper part of the vacuum cleaner. The housing or the first housing part is preferably made of plastic and the impact bumper strip is moulded thereon. The number of different parts is thereby reduced. This has the advantage that the logistics of the assembly parts and the assembly of the vacuum cleaner is simplified since the impact bumper strip does not appear as a separate component.

The arrangement of the impact bumper strip on a lower part of the vacuum cleaner and the arrangement of the retaining element on an upper part of the vacuum cleaner is especially advantageous if the lower part and the upper part are made of different plastics. If the lower part of the vacuum cleaner is made of a partially crystalline plastic such as polypropylene (PP) for example, it is especially appropriate to mould the impact bumper strip on this part since such plastics are very viscous and have a high elasticity.

The appearance of the vacuum cleaner is usually substantially determined by the upper part. These design parts should frequently have a high gloss and are thus made

of an amorphous plastic such as acetyl butadiene styrene (ABS) or polycarbonate (PC). These plastics are very brittle and exhibit only low elasticity. It is especially appropriate to mould the retaining element on these hard and barely flexible components. In general, it is necessary to construct the retaining element as largely stiff to prevent the elastically pre-stressed free end of the impact bumper strip from sliding out. On the other hand, it is advantageous to use the high elasticity of the lower part to obtain an impact bumper strip of high elasticity moulded thereon.

In addition to or as a replacement for the internal elasticity of the impact bumper strip, it can be appropriate if the elastic impact bumper strip has a cross-section which has a reduced width compared with the remaining width at least at one point of weakening. Such a point of weakening is preferably provided at a point which lies at least near the transition of the housing part to the impact bumper strip.

This alternative provides the possibility for giving the impact bumper strip a high elasticity even if the housing part itself on which the impact bumper strip is moulded only has a low elasticity. The required elasticity of the impact bumper strip is then substantially achieved by suitably dimensioning the point of weakening. In this case, the point of weakening forms a film hinge by which means the impact bumper strip is movably moulded on the housing part. The elasticity of the impact bumper strip can be defined by such a point of weakening largely independently of the material of the housing part.

In a preferred embodiment of the invention, the impact bumper strip is convexly outwardly curved in its elastically pre-stressed position. As a result of the

convex curvature, improved protection against scratching is provided since, when the vacuum cleaner impacts against furniture, for example, the impact bumper strip impacts flat against the piece of furniture and no sharp edge is present which could cause scratches in the furniture. Another advantage of the curvature is that as the forces of impact increase, the curvature at the impact point is flattened and a larger impact surface on the impact bumper strip is thus obtained. In this way, the forces produced in the event of a violent impact of the vacuum cleaner on the respective furniture are distributed over a large impact surface. This additional measure prevents scratches from forming. The convex shape of the impact bumper strip can be obtained by elastically pre-stressing a flat impact bumper strip so that it bends in a groove shape. Alternatively, the impact bumper strip can already be pre-formed in a groove shape or with a circular-segment-shaped cross-section.

If the impact bumper strip runs at least around part of the periphery of the housing, the impact bumper strip can have at least one gap-like interruption which divides the impact bumper strip into a number of a plurality of sections. The elasticity of the impact bumper strip is improved by dividing the impact bumper strip into a number of a plurality of sections. Especially when the impact bumper strip runs around a corner on the periphery of the vacuum cleaner housing, it can be appropriate to divide the impact bumper strip into a number of a plurality of sections at this point. This prevents the elastic properties from being impaired as a result of the highly curved profile of the impact bumper strip.

In a preferred embodiment, the retaining element is constructed as a retaining strip which stands proud of the surface of the housing or the second housing part, and is

inclined towards the impact bumper strip. If the retaining element is constructed as a retaining strip, the impact bumper strip can simply be snapped in behind the retaining strip which projects from the surface of the housing. An inexpensive fixing of the retaining element on the housing or on the second housing part is thus obtained and it is simpler to assemble the impact bumper strip in its elastically pre-stressed position.

The retaining element is preferably made of plastic and is moulded on the housing or on the second housing part. By analogy with the moulded-on construction of the impact bumper strip on the first housing part, the retaining element or the retaining strip can be moulded on the second housing part. A simple and inexpensive fixing of the retaining element or the retaining strip on the housing or the second housing part is thereby achieved. Separate fixing means for the retaining element can thus be dispensed with.

The retaining element is preferably constructed so that with the housing or the second housing part, it defines a receiving space in which the second longitudinal side of the impact bumper strip is held. This receiving space is preferably constructed as notch-shaped and is defined by an inner wall of the retaining element and an outer wall of the housing or the second housing part. As a result of the notch-shaped construction of the receiving space, improved fixing of the free longitudinal side of the impact bumper strip is achieved.

The second longitudinal side of the impact bumper strip is preferably held under elastic pre-stress in a position in the receiving space where the end of the second longitudinal side is located at a distance from the notch base of the receiving space. If the impact bumper strip is

constructed as convexly outwardly curved, it allows additional deformation in the event of an impact. As a result of the distance of the second longitudinal side from the notch base, the convexly curved impact bumper strip has sufficient space to become deformed inside the receiving space. The impact bumper strip can still be deformed even when the second longitudinal side of the impact bumper strip is already abutting against the surface of the housing. Further deformation is made possible by the second longitudinal side being pushed further into the receiving space in the direction of the notch base with increasing impact forces. As a result of this construction, the impact bumper strip is held reliably by the retaining element in its elastically pre-stressed position and despite this has a very high elasticity.

The invention is explained in detail subsequently with reference to an exemplary embodiment.

In the figures:

Figure 1 is a vacuum cleaner with an impact bumper strip according to the invention;

Figure 2 is a cross-section through the impact bumper strip along the line of intersection I-I in Figure 1;

Figure 3 is a cross-section through the impact bumper strip along the line of intersection II-II in Figure 2.

Figure 1 is a perspective view of a vacuum cleaner 1. The vacuum cleaner 1 has a housing 2 which is formed by a first housing part 3 and a second housing part 4. The first housing part 3 is a lower shell and the second housing part

4 is an upper shell. A cover 5 is pivotally mounted on the upper shell (housing part 4). The cover 5 closes a dust compartment arranged in the housing 2 which contains a dust separator which is not shown. A fan unit, not shown, is accommodated underneath the upper shell (housing part 4).

A front end of the vacuum cleaner 1 has a first handle 6a. The handle 6a is curved in an arc shape and is connected to the first housing part 3 at both ends. A second handle 6b is affixed to the outer surface of the upper shell (housing part 4) in the area of the rear end of the vacuum cleaner 1. The first housing part 3 and the second housing part 4 are constructed as shell-shaped and are joined to one another along a separating line.

An impact bumper strip 7 runs along the separating line over the periphery of the housing 2. On the two opposite sides of the vacuum cleaner 1 the impact bumper strip 7 runs along an arc-shaped curve whose highest point is located approximately at the centre between the front and rear ends of the vacuum cleaner 1. In the area of the rear end of the vacuum cleaner 1 the impact bumper strip 7 runs at a low level near the bottom surface of the lower shell (housing part 3).

Figure 2 shows a section of the cross-section through the impact bumper strip along the line of intersection I-I from Figure 1. The section from the housing 2 is shown in the area of the separating line where the lower first housing part 3 and the upper second housing part 4 meet one another. The impact bumper strip 7 has a first longitudinal side 8. The first longitudinal side 8 of the impact bumper strip 7 is moulded on the first housing part 3.

In its tension-free state the impact bumper strip 7 is already slightly pre-formed in an arched groove shape. At

the junction between the impact bumper strip 7 and the first housing part 3, a point of weakening 9 is applied in the vicinity of the first longitudinal side 8. The point of weakening 9 is formed by a thinning of the width of the impact bumper strip 7. The point of weakening 9 forms a film hinge by which means the impact bumper strip 7 can be pivoted with respect to the first housing part 3.

Alternatively, the impact bumper strip 7 can be made of a very soft and elastic material. In this case, the impact bumper strip 7 can be constructed as flat under no tension. The convexly outwardly curved shape of the impact bumper strip is then obtained if a second longitudinal side 10 of the impact bumper strip 7 is held in an elastically pre-stressed position 12 by a retaining element 11.

The retaining element 11 has its fixed end moulded on the second housing part 4. It projects outwards from the outer surface of the second housing part 4. In the exemplary embodiment shown the retaining element 11 projects diagonally downwards in a gable-roof shape. A notch-shaped receiving space 13 is defined between the outer wall of the second housing part 4 and the inner wall of the retaining element 11. In the elastically pre-stressed position 12 of the impact bumper strip 7, the second longitudinal side 10 of the impact bumper strip 7 is located inside the receiving space 13. As a result of the elastic pre-stressing, the end region of the impact bumper strip 7 abuts against the inner wall of the retaining element 11 near to the second longitudinal side 10.

The impact bumper strip 7 and the retaining element 11 are dimensioned and their mutual position is positioned so that a distance A is maintained between the notch base of the receiving space 13 and the second longitudinal side 10 of the impact bumper strip 7. With this construction of the

elastic impact bumper strip 7 and the retaining element 11 the second longitudinal side 10 of the impact bumper strip 7 can be pushed in the direction of the elastically pre-stressed position 12 towards the notch base of the receiving space 13 as the impact forces increase.

In the exemplary embodiment shown the second housing part 4 is constructed as a fixedly mounted hood of the fan compartment of the vacuum cleaner 1. Alternatively or additionally, the second housing part 4 can also form the cover 5. If the second housing part 4 forms the cover 5, the retaining element 11 is constructed such that the second longitudinal side 10 of the impact bumper strip 7 is also surrounded by the inner wall of the retaining element 11 in the tension-free state of the impact bumper strip 7. The impact bumper strip 7 is then bent into its elastically pre-stressed position 12 by closing the cover 5.

Figure 3 shows a longitudinal section through the impact bumper strip along the line of intersection II-II in Figure 2. In the exemplary embodiment shown the impact bumper strip 7 is divided into a number of a plurality of sections. Figure 3 shows a first section 7a and a second section 7b of the impact bumper strip 7. The sections 7a and 7b are separated by a gap-shaped interruption 15. Both sections 7a and 7b are moulded on the first housing part 3. A plurality of gap-shaped interruptions 15, as shown in Figure 3, can be provided distributed over the periphery of the vacuum cleaner 1. As shown in Figure 3, these gap-shaped interruptions 15 are especially arranged in an area where the impact bumper strip 7 runs around the periphery of the vacuum cleaner 1 with a relatively small radius of curvature.